

**BIOLOGICAL CONTROL PROGRAM
REPORT OF ACTIVITIES
JULY 1, 2009 – JUNE 30, 2010**

CERCERIS FUMIPENNIS



HEMLOCK WOOLLY ADELGID



FIRE ANTS AND PHORID FLIES



BEAN PLATASPID



Summary of Quarantine Activities 2009/2010

A total of 8 shipments of foreign material were received by the NCDA & CS Insect Quarantine Facility during 2009/2010.

ID #	SPECIES	FAMILY	STAGE	#	ORIGIN	STATUS
Q08-3	<i>Striacosta albicosta</i> ¹	Noctuidae	Egg/larvae	6,663	IA	Insects maintained on artificial diet until pupal stage.
Q08/09-4	<i>Cactoblastis cactorum</i> ¹	Pyralidae	Egg/larvae	15,000	FL	Insects maintained on artificial diet until pupal stage.
Q09-1	<i>Adelges tsugae</i> ²	Coccinellidae	Adults/ Eggs/larvae	200	OR, WA	Colony maintained in quarantine for research purposes.

¹Dr. Allen Cohen, Insect Diet & Rearing Research, LLC, is utilizing the NCDA&CS Beneficial Insects Quarantine Lab to develop artificial diets and rearing systems for *Cactoblastis cactorum* (prickly pear cactus moth) and *Striacosta albicosta* (western bean cutworm).

²Kelly Felderhoff, graduate student at NCSU is comparing the western US population of hemlock wooly adelgid with the eastern population under the direction of Dr. Fred Hain.

***Cerceris fumipennis* in North Carolina**

The native ground-dwelling wasp, *Cerceris fumipennis*, provisions its nest with buprestids, including the invasive forest pest Emerald Ash Borer (EAB) (*Agrilus planipennis*) when present. The wasp is much more efficient than humans at finding EAB, and is proving to be a reliable way to monitor for this pest. It is a solitary, ground-nesting wasp that lives in diffuse colonies in sparsely vegetated, open spaces with hard-packed, sandy soil. Colonies are almost always found in full sunshine near wooded areas in places of human disturbance (fire-pits, campsites, road and trail edges, informal parking lots, playgrounds, and baseball diamonds). In 2008, the Beneficial Insects Laboratory (BIL) of the NCDA initiated a project to locate nests of *C. fumipennis* for use in surveying for EAB and other pest buprestids; this program was continued in 2009 and 2010. The program was funded by Forest Health Protection, USDA Forest Service during 2010.

A full report of the 2009 season was distributed in January 2010. Beginning in late May 2010, a statewide survey (coast to mountains) of baseball diamonds was conducted to locate nests of the wasp. Multiple sites were surveyed in 16 counties (Alamance, Alleghany, Ashe, Beaufort, Buncombe, Gaston, Jackson, Johnston, New Hanover, Pitt, Swain, Surry, Wake, Watauga, Wayne, Wilkes). In a number of sites that contained numerous *C. fumipennis* nests, the nests were monitored and prey beetles collected. More than 100 Buprestidae were obtained and are being identified. The biology of *C. fumipennis* was studied in Wake Co. (Fig. 1). The work is ongoing.

Fig. 1 Marked *Cerceris fumipennis*, Wake Co., NC 2010.



Hemlock Woolly Adelgid Predator Rearing 2009-2010

The hemlock woolly adelgid occurs over multiple states, and is now distributed throughout the native range of the eastern and Carolina hemlock species. Hemlock is widespread in National and State Forests and Parks, and the loss of the hemlock would bring about a major change to the ecology of those areas. In addition to a loss of a unique ecosystem, dead and dying trees are a safety hazard in recreation areas, as well as aesthetically unattractive.

The primary objective for this project was for NCDA&CS to operate a large-scale central rearing facility to provide biological control agents for the management of hemlock woolly adelgid (HWA). *Sasajiscymnus tsugae* (St), native to Japan has been in mass production at the lab since December 2002. In May and July of 2008, newly collected *S. tsugae* from Japan were received in our quarantine facility to broaden the gene pool in the colony. Rearing this season concentrated on the new Japanese strain, and beetles of the older colony were sent to Clemson to supplement their stock.

The predator beetles are well synchronized with the lifecycle of the adelgid. After a summer of aestivation, the adelgid begins to mature and prepare for oviposition. Once this maturation begins in the field, adelgid on hemlock boughs which are cut and stored in spring-like conditions begin laying eggs (Fig. 1). This stimulates reproduction in the St, and the mass rearing can proceed. Rearing continues until the adelgid completes two generations, usually by June, and aestivates as nymphs on new hemlock growth.

For mass production of the colony, mating groups of beetles were placed in 3.8 l jars supplied with a bouquet of hemlock twigs. Eggs (on the twigs) were removed weekly and put in rearing cages supplied with infested hemlock. Infested twigs and water were supplied and after 4 weeks, adult beetles collected and moved into storage cages. Oviposition jars for the 2009-2010 season were set up 2 November 2009, and egg production was halted 21 June 2010. Beetles produced in this way are turned over to USDA – FS personnel for release at selected field sites.

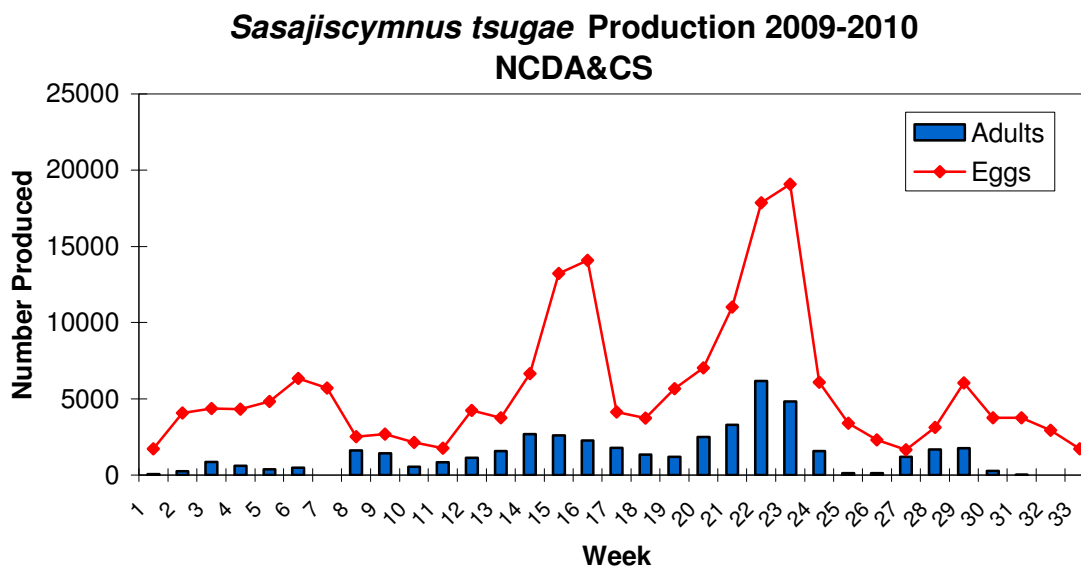
Figure 1. Hemlock woolly adelgid ovisacs.



Figure 2. *Sasajiscymnus tsugae* oviposition jars and rearing cages.

Egg production began higher than usual in the fall, and continued at high levels throughout the season (Fig. 3). However, sparse adelgid on available hemlock did not provide enough food for developing larvae. Adult production this season was low, and illustrates the importance of adequate adelgid for rearing and the need for a supplemental diet on which immature stages can develop. As the HWA infestation spreads throughout the native population of hemlocks in NC, the availability of HWA adequate in quality and quantity for beetle production is decreasing.

Figure 3. Production of *Sasajiscymnus tsugae* (old and new beetles) 2009-2010. Production started 2 November, 2009, last week of oviposition was 21 June, 2010.



Field Release and Monitoring Phorid Flies for Management of Imported Fire Ant

Since the discovery of the Imported Fire (IFA) in NC in 1953 it has spread to 71 of 100 counties. In an effort to slow the spread and decrease population size, phorid flies, *Pseudacteon* spp (Diptera: Phoridae), natural enemies of the IFA were released in NC beginning in 2000 through cooperative efforts between NCDA&CS and USDA-ARS. The phorid fly, also known as the decapitating fly, lays its eggs in foraging ants. After hatching, the larva move into the IFA's head where it secretes an enzyme that causes its head to fall off. Two species of phorids, *Pseudacteon tricusps* and *P. curvatus* have been released in the state. The species of phorid flies selected for release at each locality was based on the most prevalent IFA type present: monogyne colonies with a single queen or polygyne colonies with multiple queens. *P. tricusps* typically attacks larger workers found in the monogyne colonies whereas *P. curvatus* shows a preference for smaller workers common to polygyne colonies. Locations and species released are shown in Table 1.

Table 1. Releases of phorid flies in North Carolina, 2000-2009.

County	Year	Species	Site
Beaufort	2000	<i>Pseudacteon tricusps</i>	Fallow land
Duplin	2002	<i>Pseudacteon tricusps</i>	Rest area
Robeson	2003	<i>Pseudacteon tricusps</i>	Fallow land
Wayne	2004	<i>Pseudacteon tricusps</i>	Near pasture
Wake	2005	<i>Pseudacteon curvatus</i>	Naturalized
Pitt	2006	<i>Pseudacteon tricusps</i>	Pasture
Scotland	2007	<i>Pseudacteon tricusps</i> <i>Pseudacteon curvatus</i>	Grassy field
Wayne	2008	<i>Pseudacteon curvatus</i>	Near Pasture
Gaston	2009	<i>Pseudacteon curvatus</i>	Pasture

Delimiting surveys to monitor establishment and spread of phorid fly species were conducted July 7 - October 28, 2009. Surveys were conducted in the fall when populations of both ants and flies had had time to increase. Phorid flies were found in twenty out of the twenty seven counties surveyed. Nineteen of the counties surveyed were positive for *P. curvatus*. Only one sustained *P. tricusps* population was found, in Pitt County (See map).

In 2009 approximately 11,000 *P. curvatus* were released in Gaston County over a three week period August 31 through September 15. While collecting the ants to be sent to Gainesville, FL for parasitization by the phorid flies, we found *P. curvatus* already present at the site. USDA-APHIS personnel in Gulfport, MS indicated that the flies probably spread from a 2003 release site near Columbia, SC.

Based on surveys *P. curvatus* populations are spreading throughout infested counties and following the northern movement of the imported fire ant infestation. Plans are to continue delimiting surveys in 2010 and to release a new species of phorid fly, *P. obtusus*.



Steven Trostler, Commissioner

Phorid Fly (*Pseudacteon*) Release and Recovery Sites



RELEASE SITES

★ *P. curvatus*

★ *P. tricusps*

RECOVERY SITES

● *P. curvatus*

▲ *P. tricusps*

0 50 100 200
Miles

NOTICE: Every effort has been made to ensure the accuracy of information, but errors and omissions originating from physical sources used to develop the database may be reflected in the data supplied. The user assumes full responsibility for the accuracy and appropriateness of the information for the appropriate use of the information with respect to product safety, original use, and other conditions. The user assumes full responsibility for the accuracy and appropriateness of the information for the appropriate use of the information with respect to product safety, original use, and other conditions. This map was prepared by the NC Department of Agriculture and Consumer Services on December 8, 2016. NCDA & CS - Plant Industry Division.

Kudzu Natural Enemy Host Testing

Kudzu (*Pueraria montana* (Lour.) Merr. var. *lobata* (Willd.) Maesen & Almeida) is a common weed in the southeastern United States. Native to Asia, this plant is widely used for food and fiber. Kudzu was introduced to the US in 1876, and planted first as an ornamental then as a forage crop and to prevent soil erosion along roadsides and railroad embankments. Kudzu is now widely acknowledged as a major weed of forests and rights of way in the Southeast, and many herbicides are labeled for kudzu control on such sites. Because infestations may be extensive, remote, on marginal lands, or in environmentally sensitive areas where herbicide applications are not feasible, classical biological control of kudzu is being explored.

Several insects have been identified in China feeding on leaves, stems and roots of kudzu. Some agents have been tested in the country of origin, but shipments to quarantine facilities in the US for host plant testing have been problematic. In order to better target vulnerable stages and parts of the kudzu plants, a test of simulated wounding is proposed. Matthew Frye, a graduate student at the University of Delaware working under the direction of Judith Hough-Goldstein, planned these studies as a supplement to his own work conducted in Delaware. A temporary technician was hired to perform daily tasks for the duration of the project. Data were collected from the plants that were already established, and include crown size, leaf and stem biomass, and number of nodes. Data will be compiled and analyzed by Matt Frye. This work was completed in the fall of 2009.



Kudzu plot at Butner, NC, 2008.



***Megacopta cribraria* immature and adults.**

In the fall of 2009, an insect was found aggregating on buildings in several counties in Georgia. It was identified as the bean plataspid, *Megacopta cribraria*, an introduced insect native to Asia. In its native range, it is known to feed on kudzu and in some areas, other legumes. Work was begun in June of 2010 in the Quarantine Facility of NCDA&CS to determine its host range.